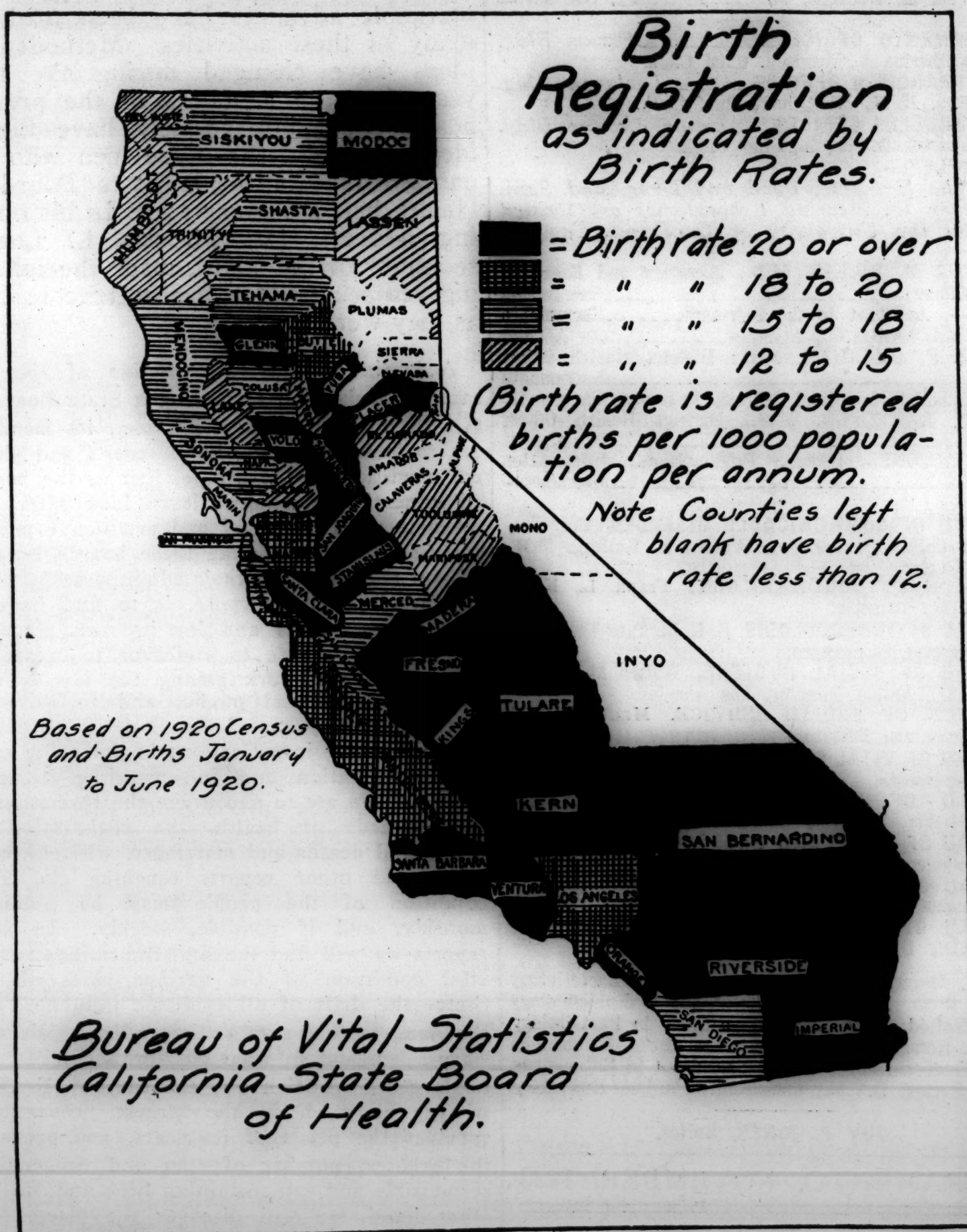


CALIFORNIA STATE BOARD OF HEALTH MONTHLY BULLETIN

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No. 5



**STATUS OF BIRTH REGISTRATION
MALARIA AND RICE GROWING**

CALIFORNIA STATE BOARD OF HEALTH MONTHLY BULLETIN

*A Journal for the Promotion
of Public Health*

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SACRAMENTO, NOVEMBER, 1920

State Board of Health Is Fifty Years Old.

Fifty years ago seven California physicians met in the State Capitol at Sacramento and organized the Califor-

nia State Board of Health. These men were Dr. Thomas M. Logan, Sacramento, Dr. J. N. Montgomery, Sacramento, Dr. Henry Gibbons, San Francisco, Dr. L. C. Lane of San Francisco, Dr. F. Walton Todd, Stockton, Dr. C. E. Stone, Marysville and Dr. Luke Robinson, Colusa. This board, during the first year of its existence, directed its attention toward many of the problems that the present State Board of Health is working on. Among these are the prevention of venereal disease, the regulation of water supplies and sewage disposal, the control of tuberculosis, the health of school children and general sanitation. During these fifty years remarkable advances have been made in many of these activities. Methods and ideas have changed during the fifty years but the members of the present board could not possibly have higher ideals than did the seven men who organized the California State Board of Health half a century ago. In his opening address, Dr. Thomas L. Logan, secretary of the board, made the following remarks, which are as true in 1920 as they were in 1870:

According to my construction of the late sanitary legislation respecting a State Board of Health and Vital Statistics, etc., its members are to look after the vital interests and physical condition of the people, just as the boards of education and agriculture look after and promote the intellectual and productive powers intrusted to them. Like these boards, so successful and useful in their administration, ours, in pursuit of its purpose, is to find its own way of usefulness and lay its own plans of operation. We are to endeavor to create an interest in our work among the lay as well as the professional public, and to raise up friends in all parts of the State to cooperate with us in our investigations in gathering sanitary information and in spreading it again abroad. We are to encourage the formation of local boards of health, the registration of births and deaths and marriages, whereby mortality and other reports touching the vital condition of the people may be obtained monthly, and if possible, weekly. In such reports we will find the first indications of the vital condition of the various parts of the State—the drift of all epidemic influence, and the dangers that may be impending. We will learn when and in what circumstances life has its largest expansion and the smallest burden; where childhood, in the largest proportions, survives the perils of its years, and prepares the greatest number of men and women for responsible and self-sustaining life; and, on the other hand, we will discover the places and circumstances, where, of those who are born, the fewest pass through the dangers of infancy to become workers in society.

Apprehensions have been expressed lest in this land of liberty the sanitary measures sought might press too heavily on the individual and lessen too much the freedom of

personal action. It seems to me this is not likely, if we pursue with due circumspection the course just sketched out. Our duties are not executive, but advisory; and so long as the state acts cautiously, and on well assured, scientific grounds, there is no danger but that the observance of our sanitary rules will be voluntary and not compulsory. There may be cases, however, in which it will become necessary to compel obedience to the rules of hygiene. For example, pure air and pure water are necessities of life; but an individual may have little control over these elements, and may be powerless to prevent other persons from contaminating them, and thus striking at the very foundations of his health and happiness. Here, as in many other emergencies that may arise, the state must step in for the protection of its citizens and enact rules which shall be binding upon all.

Fifty years have brought a greatly lowered death rate and an extension of more than a decade to the average human life. The advances in sanitary science during this period have added greatly to the life and happiness of Californians. The next fifty years, however, must show even greater advances in the promotion of the health and welfare of the people.

★ ★ ★

Better to Fill Teeth Than Card-Index Them.

The medical officer of health of an English city writes in his annual report that he becomes more and more firmly convinced that any public money to be spent on treatment can be much more profitably employed in dentistry than in any other branch of medicine and surgery. He states that the salary of one medical inspector would provide adequate dental treatment for about four thousand children in England. His report ends with the striking axiom "it is better to fill decayed teeth than to card index them."

★ ★ ★

Public Health Nurses Should Be Certified.

The attention of nurses is called to the resolutions of the California State Board of Health relative to the registration of public health nurses, within the state. After the first of April, 1921, an examination in public health nursing will be required of all nurses who desire certificates as public health nurses. Under the present waiver six months expenses in public health nursing may qualify for certification without examination. Registration under the Bureau of Registration of Nurses is a prerequisite for cer-

tification as a public health nurse. Following are the Board's resolutions:

Resolved, That the qualifications for employment as a public health nurse, under the provisions of section 3062 of the Political Code and of section 4225a of the Political Code, 1919 Statutes, shall be as follows:

1. She shall be a registered nurse in California.

2. She shall present certificate of graduation from a school of public health nursing accredited by the National Organization of Public Health Nursing at the time of her graduation, and she shall pass the examination prescribed by the State Board of Health of California.

Provided, during the year following the passage of this ruling, any nurse actively engaged in public health work may register under the following conditions:

1. She shall be a registered nurse in California.

2. She must have been employed in Public Health Nursing work for at least six months prior to the date of her application for registration as a Public Health Nurse in California.

Adopted by the California State Board of Health on April 3, 1920.

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Kill Dangerous House Fly Now.

Now is the time to kill the dangerous house fly. The Merchants Association of New York City has distributed a poster in which it is set forth that the house fly discovered between Thanksgiving and Christmas should be killed at once as it has fattened for hibernation for the winter months. In the spring it will emerge from its winter quarters and will begin to raise its summer progeny of disease carriers. The association advises that the house fly may now be found in all warm places in the home, especially in the kitchen and dining room, languid and lazy, and can easily be disposed of by housewives or children. It is more important to exterminate the relatively few flies that may be found in dwelling houses now than to exterminate thousands of them next spring and summer.

★ ★ ★

A National Association of Public Health Women.

The American Association of Women in Public Health is now in progress of formation. Women have injected new life in public health work. In order to promote their common interests and purpose as well as to provide a bigger opportunity for women, this association is being organized. The leaders plan affiliation with the federation of business and professional women's clubs.

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CALIFORNIA STATE BOARD OF HEALTH

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WHEREIN THE CONTROL OF TUBERCULOSIS DIFFERS FROM THE CONTROL OF MANY OTHER INFECTIOUS DISEASES—SOME PRACTICAL DIFFICULTIES.¹

By ROBERT A. PEERS, M. D., Member of the California State Board of Health.

The most important, and at the same time probably the least clearly understood, angle of the tuberculosis problem is the matter of control. The successful control of all infectious disease as in tuberculosis depends upon four factors:

1. Knowledge of the disease.
2. The cost of control.
3. Its morbidity and mortality statistics.
4. The amount of interest with which control is regarded by the public.

These then may be said to be the determining factors in the control of any disease. It is my desire this afternoon to briefly analyze these four factors and point out wherein the control of tuberculosis differs from and, in some cases, where it resembles that of other infections. By this method I hope to show why the elimination of tuberculosis has been and of necessity must continue to be, barring the discovery of a new and rapid cure or an efficient method of prophylaxis, relatively slow and unsatisfactory.

Let us consider the first factor—how knowledge of a disease contributes to its control; and I expect to direct the greater part of my paper to this topic as knowledge is the basis of all our calculations and efforts.

There are certain things of varying relative importance which we must know about any disease if we hope successfully to control it.

Diagnosis of Prime Importance.

Of prime importance is the matter of diagnosis. We must be able to state what the disease is because dif-

ferent diseases call for different modes of attack. And here we meet with a very practical difficulty in the case of tuberculosis. Some diseases make themselves known early by the presence of a specific rash, the identity of others can be definitely settled by laboratory or biologic tests, and yet another by a peculiar characteristic cough, and yet another by the inflammation and swelling of certain glands. But with tuberculosis the only definite thing to be noted in the symptoms and physical signs are their puzzling indefiniteness. This is practical difficulty number one.

The next item of value we will consider under the heading of "knowledge of the disease" is causation. This may seem very simple. Infectious diseases are caused by germs; we know the specific germs of some diseases and we are ignorant as to those of certain others. But really the matter of causation is very complex, especially in tuberculosis. The cause of infection is the specific germ. The causes of disease, especially of tuberculosis, are many. Infection and disease in tuberculosis do not, by any means, mean one and the same thing. Nearly every one at some time or other is infected by the tubercle bacillus but fortunately only a small percentage develop the clinical disease. The answer to the question as to the causation of tuberculosis, that is, the development of tuberculous disease in the infected person, is to be found in a thorough and complete understanding of our entire social and industrial fabric—in our daily habits, in our housing, in our factories, in every-

¹Read at the Twelfth Annual Conference of State, County and Municipal Health Officials, Chico, California, November 8-11, 1920.

thing with which human beings come in contact. And who has such a thorough and complete understanding? Therein lies practical difficulty number two.

The third item under this heading to which I would call your attention is "methods of transmission." How is the disease carried from one patient to another? Some diseases are carried by contact, contact between persons or with articles recently and intimately used by the sick. Others are carried by insects such as mosquitoes and fleas. In others perhaps the disease germ gains admission by inhalation. Still others are water-borne or food-carried. We know how to control many diseases by breaking the chain between the sick and the non-immune. But what of tuberculosis? Undoubtedly the tuberculosis germ passes from one person to another by contact. But how intimate must be that contact? And what inanimate articles and things used by tuberculous patients are dangerous and what are not? Undoubtedly in some cases the tubercle bacillus gains admission to the body in food and drink. But what percentage of cases are infected in this manner? What foods are the most dangerous and when? Perhaps some cases of tuberculosis are caused by inhalation of germladen dust. But what percentage? And what dusts and under what circumstances are dusts most dangerous? The manner of transmission of tuberculosis is yet very imperfectly understood and offers practical difficulty number three.

And yet again as to the matter of transmission. We know that there are three dangerous types of infected individuals:

1. The acutely ill.
2. The missed case.
3. The carrier.

Of these, the first, the acutely ill, is relatively unimportant in the spread of disease. We can control his comings and goings. We can limit the number of contacts. We can sterilize, if necessary, everything he touches and everything which touches him: we can destroy or sterilize his excretions.

But of the missed case and the carrier there is absolutely no check except when discovered and with tuberculosis there are several missed cases to every known case and at least one carrier to several known cases. The missed case and the car-

rier in tuberculosis undoubtedly play havoc with our control of the problem.

A fourth item worthy of consideration and of understanding is the course of the infectious disease. What is the period of incubation? How long is the acute stage? When is the most infectious time? When is the danger of infection passed? We may know the period of incubation in measles, in scarlet fever, in smallpox, in a score of other ordinary diseases, but who knows the period of incubation in tuberculosis? How long a time elapses from the formation of the first tubercle to the appearance of the first symptom? And what are the first symptoms?

We know the average length of time of typhoid and can at least predict within a space of a few months when whooping cough will disappear, but how can we measure the time of the acute stage of tuberculosis with its misleading remissions followed by its disappointing exacerbations? What in typhoid is measured in weeks, in tuberculosis must be calculated in months and years. We may recognize the period of incubation as the most dangerous infectious stage in measles and by means of swabs and cultures we may be able to conclude that the infectiousness of a given diphtheretic patient is at an end. But who can definitely state when a tuberculous patient is most dangerous to others or by what laboratory tests can we conclude that he is no longer capable of transmitting infection? Because we cannot hear him cough does not mean that tubercle bacilli no longer pass the portals of his mouth and because we do not find tubercle bacilli after several examinations of his sputum is no guarantee that they will not be there tomorrow or the next day or any other day. And so long as there may be tubercle bacilli in his sputum he is potentially dangerous. The mere fact that he seems well, feels well, and can work without exhibiting symptoms does not mean that he is safe. The problem of control in tuberculosis is again different.

Active Preventive Measures.

Let us turn from these phases of control of infectious disease to the active measures of prevention. In typhoid we can boil water, destroy excretions, regulate carriers. With tuberculosis we can use certified or pasteurized milk it is true, but who will guarantee that the patient will

destroy all of his sputum religiously and scrupulously for years? And who can discover and control all tuberculosis carriers?

For smallpox we can vaccinate and for typhoid we have protective inoculation, for gonorrhea and syphilis we have local applications which offer a fair degree of protection, but what can we offer of a similar character to prevent tuberculosis? Nothing but a hygienic regime which our present competitive social and industrial relations, built up during ages of ignorance of hygiene, overrule.

Certain diseases we can shorten by drugs and sera, thus materially shortening the period of infectivity, but we have no cure for tuberculosis but the slow tedious hygienic-dietetic regime.

And then we have quarantine by which the patient is isolated and not allowed to come in contact with the nonimmune. It is practicable only when diagnosis is made early or where one can definitely show either by laboratory findings or as a result of experience that the patient is dangerous to others, or where the number of persons infected or the length of the disease does not render it prohibitive. Try to apply these standards to tuberculosis. Get your patient early. How? By means of a tuberculin test? Then you must perhaps quarantine the doctor who prescribes, the nurse who administers the medicine, the cook in the kitchen, the grocery boy who delivers the supplies, the mail carrier who leaves the letters. Or would you quarantine only those with tubercle bacilli in the sputum and allow the tubercle bacilli free persons their liberty? Then you must examine the sputum of every spitter, not once or twice, but every day, and you will find that there is a threshold, indicated by percentage of population infected, which when passed renders quarantine impracticable. We find in direct active measures of control more practical difficulties.

Cost of Control.

Let us now take up the three remaining elements mentioned in the beginning of the paper as determining factors in the success or nonsuccess of control. First of these three is the cost of control. Health is purchasable. Freedom from epidemic and endemic disease is also purchasable. These two statements are relatively correct and freedom from infectious

disease of any sort can be purchased providing only that sufficient funds are available and that such funds are wisely expended. Some infectious diseases can be controlled at a very low cost, not only low in total expenditure, but also low in per capita tax. Some diseases can be controlled only by large expenditures and with a relatively high per capita tax. Diseases easily and cheaply controlled in some localities offer very serious financial difficulties in other regions. An example of the latter can be seen in the relative low cost of malaria eradication in well drained or easily drained districts, and the high cost in other districts presenting expensive and extensive drainage and engineering problems. Diseases of short duration cost less than those where the time of illness is longer. Many other factors enter into and increase or decrease costs. When we reflect for a moment on the many elements constituting the contributory causes of the development of active tuberculosis among the infected part of the population and contemplate the cost in dollars and cents of reconstruction of dwellings and of factories and industrial plants, and estimate the cost of shortened hours and increased wages with their inevitable resultant increase in the cost of living, we will begin to realize something of what is meant by cost of control. And when we consider the thousands of advanced cases which should be taken from their present environment and transferred to hospitals for purposes of partial isolation, and we think of the support of such patients during the long months and years of illness and remember the financial burden of the dependents left at home, and when we try to estimate the added burden of construction of buildings to house the advanced or moderately advanced patients, we begin to realize more than ever the practical difficulties of tuberculosis control.

Then there is the factor of morbidity and mortality statistics. Where morbidity and mortality are small in numbers or in relation to the population, the problem is relatively simple, but where, as in tuberculosis, the morbidity is so great that it is impossible to estimate correctly and where the mortality practically leads all other infectious diseases, it is easy to see the practical difficulties presented.

Public Interest.

But all that has gone before brings us to the last but not the least of the four determining factors—the amount of interest with which control is regarded by the public. And the amount of interest displayed by the public in the prevention of any disease depends upon those things already mentioned—their knowledge of the disease, the economic drain it causes as compared with the cost of removal, and the morbidity and mortality. It depends also upon the character of the manifestations of the disease and upon the length of their acquaintance with it.

The tuberculosis problem is in a sense a very peculiar one and its solution has been hampered to a large extent by ignorance and wrong teachings, by the lack of the spectacular in the manifestations of the disease and by that familiarity which breeds contempt and robs us of fear or rather lulls us into inaction and apathy. Fortunately these adverse conditions and circumstances are gradually giving way to enlightened interest. Knowledge is taking the place of

ignorance and wrong teachings. The steady and persistent efforts on the part of the few tuberculosis workers of a few years ago is bearing fruit and the army of anti-tuberculosis workers today affords abundant testimony that inaction is giving way to action and apathy to a lively interest. If tuberculosis were only some new scourge instead of an old evil which we have always had with us, if it only started with a red rash instead of a tired feeling, if it ran a rapid stormy course instead of holding to a slow uninteresting daily routine, if it could only get into the headlines of the front page instead of into the small print of the death notices on page seven, the last thing necessary to awakening the requisite amount of interest in the public would be accomplished. But it is not so and the control of tuberculosis must still remain a slow, costly process; but no one who has watched the anti-tuberculosis movement of the past two decades can believe other than that in time all the baffling practical difficulties will be eventually overcome.

MALARIA CONTROL.²

By WILLIAM B. HERMS, University of California, Consultant State Board of Health and Member National Malaria Committee.

Malaria control is no longer a dream nor an experiment. This applies to California as well as to all other parts of the world. The first demonstration of malaria control began in Havana under the late General Gorgas in 1901 and was an unqualified success and won for that great sanitarian the task of freeing the Panama Canal Zone of this scourge. Yellow fever, we are informed, had not been prevalent in that area for some time prior to the undertaking. Malaria was the spectre that laid cold hands upon the natives and imported workmen, collecting an enormous toll of human life. That project, namely, the sanitation of the Panama Canal, presented a problem of great magnitude, and even Gorgas, although absolutely sure of success, spoke of it as a grave task. The result of his work is known to all present and his indomitable courage has been an inspiration to many.

Many of us recall with some amusement the days prior to 1898, the year of Ross' discovery that malaria is a mosquito-borne disease. We recall the

various warnings that were given, which ranged from things we ate and drank to hot sunshine and the night air, with never a suspicion of mosquitoes except by a very, very few who suffered the sting of ridicule. I recall how as a college boy I received this news of Ross' discovery and now realize that in a large measure it turned the tide of my own life.

Blight of Cities and Nations.

As this disease lays its blight upon the individual, so also does it blight cities and even nations. One of the most graphic accounts of the effect of malaria upon cities and nations has just recently been given us by Ravenel in his article on "Endemic Diseases vs. Acute Epidemics" in the October, 1920, American Journal of Public Health. He says in part, "Two great civilizations of the past, both of which left treasures of literature, poetry and art, which have never been surpassed and seldom equaled, have disappeared. One had its home in Greece,

²Read at the Twelfth Annual Conference of State, County and Municipal Health Officials, Chico, California, November 8-11, 1920.

the other in Italy. It seems fairly certain that endemic disease, especially malaria, played a large part in the decline and fall of these ancient peoples, sapping their vitality, destroying their health and changing their character.

* * * The blighting effects of malaria on energy and character were recognized by the early Greeks. The word melancholy, meaning black bile, occurs soon after the Greek words for malarial fever became common.

* * * There is no doubt that contemporaneously with the increase of malaria, as shown in both medical and lay writings, Greek character began to change for the worse—decay set in. Their brilliancy left them, initiative was lost, vacillation and indecision, weakness, cowardly depression and cruelty marked their conduct. The philosophy of even their best writers became pessimistic, and their former lofty patriotism was lost." Well do I agree with Ravenel, for I too have seen with my own eyes what malaria did to some of Italy's towns in the Roman Campagna. These are not matters of sentiment, but cold facts.

You may say, "Yes, but that is long ago and far removed from California, only the South has problems of this kind to deal with now." But may I remind you, that our malarial districts comprising an area about half the size of Mississippi (a recognized malarial state) had a malarial death rate in 1916 of 14.2 per 100,000 against a rate of 5.9 per 100,000 for whites and 8.4 per 100,000 (colored) for Mississippi? In other words our malaria death rate for the infected area was at that time nearly three times as great as that of Mississippi. Furthermore, the malaria death rate for one district in a northern county was 64.1 per 100,000 in 1918, a rate probably not equalled anywhere in the United States. We do truly have a malaria problem to control in California.

Malaria a State Problem.

It must not be assumed that the good and intelligent people of this state have been sitting idly by and doing nothing. The first malaria-mosquito crusade in California was organized at Penryn, Placer County in 1910 with good success and lasting results. Of that work Mr. H. E. Butler writes as follows: "From the time the first orchards were planted (on a

commercial scale about 1880) and irrigated from miner's ditches up to about 1910 malaria was very bad indeed here. As a matter of fact we could not keep any white men at work. They had malaria and would leave as soon as able to walk. An English colony established here in about 1892 failed utterly because the colonists suffered badly from malaria. Dr. O. L. Barton of Loomis, who has practiced medicine here for thirty odd years or more states that whereas he was formerly treating hundreds of malaria cases, in recent years he is seldom called for that trouble. The difference is so great it is most marked." A large number of mosquito abatement districts (sixteen in all) have been organized since, with the culminating demonstraton district at Anderson in Shasta County, which might well be taken as the pattern for future control operations in California.

Malaria is a state problem even though its distribution is local. The dark malarial spots are not only in Shasta, Butte or El Dorado counties but are, to the world at large, in California. Travel in California, particularly by automobile, carries thousands of persons through the malarial sections during the summer and infection is common. The problem is yours and mine no matter whether we live in Redding, San Francisco, Fresno or Los Angeles.

Results of Malaria Survey.

Information pertaining to the distribution and occurrence of malaria in California has been accumulated and methods of control have been demonstrated. Like the work of Gorgas in Cuba and in the Panama Canal Zone we have tried to build our work on solid ground—a careful study of the state has been made, the distribution of the malaria bearing mosquitoes and the endemic foci of malaria are now fairly well known—the way for further research in this field has been paved and the path to control is clear.

It goes without saying that the individual or organization which knows most about the enemy is in the best position to combat and overcome the same. For that reason the University of California and the State Board of Health have cooperatively carried on careful investigations on the species, life histories and habits of mosquitoes occurring within the limits of the state, as well as methods of control.

Anopheline mosquitoes are widely distributed in California, nearly every

county having representatives of this genus. This might lead one to believe that we are dealing with a state wide infection which is not the case. We have three species of Anophelines, two of which (*A. quadrimaculatus* and *A. punctipennis*) are malaria bearing and one (*A. pseudopunctipennis*) probably quite negligible in this respect. A knowledge of this fact alone results in a great saving to the State. Furthermore, several of our coastal counties have numerous *A. quadrimaculatus*, but are without endemic malaria, probably because of the influence of climate on the insect host and the malarial parasite. Furthermore the breeding habits of anophelines vary with the species, as well as egg laying habits, flight and adult rendezvous, (indoor, outdoor, outhouse, etc.) Thus during the investigations carried on by us during the past summer it was found that *A. quadrimaculatus* is a typical indoor mosquito, while *A. punctipennis* is almost wholly restricted in its biting habits to out-of-doors, porches, stables, privies and other out houses, etc. Furthermore we found that a much larger number of eggs is laid per female at one laying than hitherto believed, namely 209 for *A. quadrimaculatus* and 203 for *A. punctipennis*, and we were able to observe probably for the first time on record the complete process of egg deposition from start to finish. We also discovered that the eggs of *A. quadrimaculatus* are able to withstand desiccation for seventy-two hours, while *A. punctipennis* eggs are killed by desiccation in twenty-four hours. Also an examination for malaria parasites on the stomachs of three hundred wild Anophelines proved negative. These investigations are absolutely essential to successful and economical malaria control.

Permanent Control Measures.

Control methods are in general largely familiar to all of you and need little emphasis here, however, it should be said that the more permanent methods are being practiced, namely drainage and correction of water courses and irrigation ditches. By such methods also vast acreages of land, otherwise useless, have been reclaimed for agricultural purposes. Oil is still used (first used on a large scale at Havana in 1901) as an expedient to bring quick results and is also employed where drainage is too expensive or impossible. Oiled sawdust and other oil holding substances are commonly used. Control by periodic drying out of irrigation ditches was successfully

demonstrated during the past summer on the Stanford ranch at Vina.

Screening of dwellings is strongly urged as well as the destruction of mosquitoes which have gained access to the house. This latter is a very important measure, since the house inhabiting mosquito is largely responsible for the transmission of infection in our more malarial districts. Cinchonization, both for prophylactic and sterilization purposes, cannot be too strongly urged.

Therefore, an ideal malaria control district must practice the following measures—drainage, correction of water courses and irrigation ditches, oiling, screening, destruction of indoor mosquitoes and cinchonization. Thus far our malaria control efforts in California have been more or less sporadic. The time is opportune for a determined, vigorous and concerted stand to be taken against malaria in this state, or we shall face serious consequences.

Great Economic Losses.

In 1918 the people of this state lost at least 168,000 work days because of malaria, numerous farms went short handed, crops suffered because of labor shortage, real estate values are materially decreased, mental retardation of childhood results, etc. To understand the value of malaria control one should have known Anderson (Shasta County) prior to 1919 and again in 1920. Unbelievable changes for the better have been wrought.

Epidemics of plague, influenza and even yellow fever do not exert the devastating moral, physical and financial effects upon a community that inevitably follow the introduction of unchecked malaria. These more acute infections occur, cause a temporary panic, claim their toll, sometimes extremely heavy, but inevitably disappear, and in the years intervening before their recurrence are almost entirely forgotten. With malaria, however, unless steps are taken for its control, its subtle and insidious attack upon the vitality, initiative, and enthusiasm of a people increases month by month and year by year until we find communities otherwise blessed with all the bounty of nature reduced to a collection of hovels and peopled by a race of anaemics lacking even the initiative to move away to more healthful environments where fresh starts would be possible.

High Morbidity Rate.

On account of the low mortality in connection with the high morbidity rate

of malaria (.2 of 1 per cent of those infected dying) it has been estimated by reliable authorities that each death from malaria represents 3,000 lost work days, a loss in California as above stated in 1918 of 168,000 days which converted into day laborers compensation piles up a wage loss of three-quarters of a million. Nor is this the only loss incurred, literally thousands have drawn wages for services that they were able to deliver only partially due to infections that were not completely incapacitating, crops were half heartedly cultivated and harvested with the inevitable result that production was lowered, entailing a loss to the producer, to the transportation company, to the manufacturer or distributor and inevitably higher prices to the consumer. The chain of contributing losses is too complicated and involved to warrant accurate consideration, but as examples it is firmly believed that the annual expenditure for malaria "cures" and tonics alone would go a long way toward effective state wide control. The subject of losses can not be closed without a statement concerning the depreciation of land values in a malarial district. Such a district is invariably characterized by an inordinate desire on the part of the inhabitants to sell at any price and a general disinclination on the part of the purchasing public to buy. The result is disastrously low land values and a stagnation of the realty market. Although practically no land had changed hands in the Anderson Valley during 1918 and the early part of 1919, in the three months following the intensive campaign of malaria control in 1919, property to the value of over one-half a million changed hands at a profitable price. An extremely conservative estimate has placed the annual loss in California due to malaria at \$1,600,000.

State Aid and State Control.

The malaria of California exists today in relatively small, separated areas, that are financially unable to meet the burden of their local control operations. The evidence at hand seems to show that the endemic areas are not decreasing in size or virulence but are slowly and surely increasing in area and severity. The communities involved are equal neither to the successful administration, nor to the financial burden of their malaria problems. The ultimate solution points conclusively toward state aid and state control.

In this connection and in closing it is appropriate to quote the editor of the "Anderson Valley News" in an editorial of August 27, 1920, entitled "Malaria, Last Year and This," in which he says in part:

The presence of a single mosquito is now a call to arms and the occurrence of an isolated case of malaria calls forth the wonder and sympathy of the entire community. * * * What Anderson has accomplished, other California communities can accomplish, providing funds are made available for fundamental work, the cost of which is beyond the means of the community to assume. Although the malaria problem may seem to be a strictly community affair and the utilization of state funds dangerously savoring of log rolling and paternalism, in the last analysis, it is a strictly state affair for as long as these "sore spots" of malaria are allowed to exist up and down the great central valleys of California, the Golden State will still be classified in that rapidly decreasing Blacklist of Commonwealths, the eternal stumbling block of prospective settlers, the roll of malarial states. The demonstration at Anderson has shown the way out and if the convening legislature heeds the advice of the great Disraeli that the statesman's first duty is to protect the public health of his country, we shall look for a continuation in the communities of the remarkable work that has rejuvenated Anderson. Happy and grateful Anderson wants the state to know of its victory, its prosperity, and its gratitude."

SHOULD RICE RAISING BE PROHIBITED NEAR TOWNS?³

By W. C. PURDY, Special Expert, U. S. Public Health Service, Chico, California.

Our title would seem to indicate that the growing of rice near centers of population is not on a par with the growing of wheat, apples, alfalfa or similar crops, and that the reason for this disparity lies in some danger, fancied or real, to which those people who live near rice fields are exposed.

In more precise terms, the standing water necessary for rice growing is a possible danger to the well being of the

near-by populace, because of the malaria-bearing mosquitoes that apparently breed in these rice fields.

We may now re-state the question: Does rice raising take rank as an asset, or a liability? Do the material benefits accruing to the community outweigh the danger to the public health?

Notice is hereby given that these questions can be settled only by careful consideration of the factors in any given

³Read at the Twelfth Annual Conference of State, County and Municipal Health Officials, Chico, California, November 8-11, 1920.

case. This paper is intended merely to add a little to our general fund of information relative to mosquitoes in the rice fields.

Two interests are concerned in this matter:

- (1) The rice industry; and
- (2) The health of the people in a near-by town.

The Rice Industry.

This industry is so well known that a brief mention is sufficient.

Rice is a staple food. Like corn, wheat, or other grains, it forms a large part of the food of man. Consistent with this status, very large areas are devoted to the raising of rice; great numbers of men find their livelihood in this work, and millions of dollars are invested in the industry, so that it is intimately woven in the industrial fabric—not only of our country, but also in that of many other countries, notably Italy, Japan and China.

Such a basic industry should be encouraged, rather than checked, even in a small degree, unless there exist the best of reasons to justify such limitations of rice culture as may be imposed in a given community.

The Public Health in a Nearby Town.

The average town or village is an assemblage of people who, whether they be day laborers, professional men or millionaires, have the right to life, liberty and the pursuit of happiness. Without doubt, the health of the community is pre-eminently a vital factor in the normal progress and growth of the town. Any danger to the community health, or public health, should be most carefully considered, and calmly, but justly appraised.

The word "appraised" is used advisedly; for good health, and even life itself, has an appraisable value; and good health is, to a certain extent, a purchasable commodity.

In support of this assertion, I need only to cite the various occupations that are classed as "hazardous" and "extra-hazardous" rather than "safe." And those industries are carried on year after year, notwithstanding the toll they have taken, and will continue to take, in human life and health.

The matter, therefore, becomes one of relative values. To abolish the mining industry for instance, because of the heavy toll in human life, would inflict greater damage and suffering on the community than does the unavoidable

loss of life incident to this extra-hazardous occupation. It is thus that a community or a nation "counts the cost" and appraises any contemplated activity—by considering not only the material income, advantage and community advancement, but also the outlay in terms of men, money and community well-being. The result of this appraisal may be termed the Relative Risk, or Hazard of a given undertaking.

What is the relative risk of the prevalence of malaria in a town near the rice fields?

We must first consider to what extent the rice fields are responsible for the existence of anopheles mosquitoes, and whether these mosquitoes have convenient access to cases of malaria and, finally, to the people in the near-by town, thus infecting them and producing the prevalence of malaria.

In Arkansas, examination of three rice fields showed both *Anopheles* and *Culex* breeding in about equal and moderate numbers. This was in 1918.

In California, in 1919, one field showed practically no breeding of either *Anopheles* or *Culex*. In 1920 this same rice field gave the same results: no breeding. During this same season (1920) three other fields in California showed breeding of *Anopheles* and *Culex* in varying numbers and ratios. Thus, one field (Nord) averaged eight *Anopheles* and 26 *Culex* per examination, another field (Durham) showed 30 *Anopheles* and 11 *Culex*, while the third field (Anderson) averaged 33 *Anopheles* and 20 *Culex*. All examinations were made in the same manner, and the results are therefore comparable. Moreover, the figures given are averages of weekly examinations made during the rice season.

Therefore the status of these four fields, relative to their production of *Anopheles*, may be conveniently expressed by the season's average of *Anopheles* larvae in the respective fields, viz: 0, 8, 30 and 33.

Extensive collections of adult mosquitoes of northern California by Prof. Herms, of the University of California, and continuous collections weekly from one location for nearly a year by the writer show that 40 per cent to 50 per cent of the *Anopheles* mosquitoes found were the malaria-carrying variety, *A. quadrimaculatus*. On this basis we may approximate the relative malaria possibilities or relative hazard of the above rice fields, and express it numerically as about 50 per cent of the average numbers given or 0, 4, 15 and 17.

Drainage and seepage from the rice fields, or from the canals feeding the rice

fields, were similarly examined in connection with each of the four California fields mentioned. The Nelson field showed practically no *Anopheles* breeding in seepage water; seepage from the Nord field averaged 12 *Anopheles*; seepage from the Durham field averaged eight *Anopheles*, and seepage from the Anderson field averaged 81 *Anopheles*. Taking 50 per cent of these numbers and adding to the number representing the "malaria possibilities," of the respective corresponding rice fields, we find the results are 0, 10, 19 and 57 respectively. In other words, drainage and seepage water, part of which is preventable, has very greatly increased the probable danger in three of the four rice fields examined.

It will thus be seen, that in the cases mentioned, the rice fields varied widely in the matter of the production of *Anopheles*. Just why there should be such great variation is not yet settled.

Anopheles mosquitoes are harmless if they have no opportunity to acquire infection. They can still bite, but they can't transmit the malarial parasite unless they themselves have bitten a person suffering with malaria. Thus, if there are no cases of malaria in the neighborhood, the mosquitoes can do no harm. Also, the matter of *distance* is a factor.

It is definitely known that mosquitoes are able to fly a mile, or over, but observations seem to indicate that they do not, as a rule, fly such a long distance, although they may in some cases be carried a mile or two by winds. Therefore, if rice fields are three or four miles

from the town, there is little probability of the mosquitoes reaching this town. Local mosquitoes are usually the product of local breeding places, such as barrels, tubs, tin cans, leaky faucets in yards, or garden, etc.

Another fact should be borne in mind: The rice fields are operative only four months of the year, while certain ditches, puddles or other breeding places may be prolific sources of mosquitoes during half or two-thirds of the year

If then—

- (1) Some rice fields, as Nelson, do not produce *Anopheles* at all; while
- (2) Other rice fields, as Nord, produce them in moderate numbers; and
- (3) Still others like Durham and Anderson produce *Anopheles* in large numbers; and
- (4) The numbers produced in rice fields are usually greatly increased by the numbers breeding in adjacent seepage water; and, further, since
- (5) Noninfected *Anopheles* are harmless; and
- (6) Usually do not fly more than a mile or two;

Then, in justice to all concerned, any curtailment of rice raising in a given community should be preceded by—

- (1) Inspection for mosquito production in local yards, gardens, etc.; and

Table 1. Showing Average Catch of Mosquito Larvae and Approximate Relative Malaria Hazard of the Community Near Four California Rice Fields, 1920.

Place	Number of examinations	Average catch		Approximate relative malaria hazard of the community (based on average catch of <i>Anopheles</i> larvæ)
		<i>Anopheles</i> larvæ	<i>Culex</i> larvæ	
1. Nelson—Rice field -----	9	0	10	0
Seepage from canal -----	9	0	26	0
Seepage from canal -----	10	0	2	0
Malaria hazard -----				0
2. Nord—Rice field -----	10	8	26	4
Drainage from rice field -----	10	12	26	6
Malaria hazard -----				10
3. Durham—Rice field -----	10	30	11	15
Drainage from rice field -----	10	8	7	4
Malaria hazard -----				19
4. Anderson—Rice field -----	12	33	20	17
Drainage from rice field -----	13	81	8	40
Malaria hazard -----				57

- (2) Abolishing of all preventable and near-by breeding places; and
- (3) Persistent use of quinine by any persons (in the locality) suspected of having malaria; and
- (4) Screening of sleeping places; and
- (5) Examination of any rice fields (or other waters) within a mile or two of town, to ascertain whether mosquitoes are actually breeding in public health quantities in those fields. All these

should precede any interference with an industry as valuable to mankind as that of raising rice.

But—

- (6) If a near-by rice field is a prolific source of Anopheles, and
- (7) Malaria is prevalent and persistent, constituting a public health problem in the community,

Then, in justice to all concerned, control or abolish the near-by rice fields and their attendant waters.

PLAGUE IN THE CALIFORNIA GROUND SQUIRREL.⁴

By W. T. HARRISON, Assistant Surgeon, United States Public Health Service.

With the discovery in 1908 of plague infection in the ground squirrels of the San Francisco Bay region, a problem presented itself to the health officers of the state and nation which has so far resisted all efforts to solve. We have learned how to deal with epizootics of this disease among rats in cities, but the same methods of extermination are with great difficulty applied to squirrels. The territory involved in the state is so great, approximately 17,000 square miles as compared with not more than 45 square miles in the city and county of San Francisco, that to successfully cover the entire area would require more men and material than have yet been available. The animal is also much more tenacious to life than the rat, and while not such a prolific breeder, his habits and mode of life more than counterbalance his comparatively slow rate of reproduction.

The United States Public Health Service in cooperation with the State Board of Health and local authorities has been actively engaged in a campaign of extermination against ground squirrels for the past twelve years. These efforts, in addition to the actual numbers of squirrels killed, have created among the rural population a demand that squirrels be exterminated from an economic viewpoint, since it has been shown that one squirrel will destroy in one year grain to the value of thirty dollars. Great damage is also done to orchards, particularly almonds and walnuts. The Federal Biological Survey conducts continuous operations on Government lands, and in each county, the Commission of Horticulture, in cooperation with the State Department of Agriculture, is carrying on more or less extensive operations. It

is probably conservative to estimate that in the state as a whole reduction of the ground squirrel population during the past ten years is at least 50 per cent. In some counties the percentage of reduction is, no doubt, much larger.

Poisoning Most Effective.

Since all of these agencies are engaging in a work which is of great value to the state from a public health standpoint, their efforts should meet with the heartiest approval and support of health officers everywhere. While they operate under a state law, and for economic reasons only, as long as plague remains among these animals in any locality, the danger of the spread to other regions is very real.

After these several years of active work on the problem, it has been found that the most satisfactory method of destroying the squirrel is by means of poisoned barley. This poison is prepared by coating cleaned barley with a mixture, the active ingredient of which is strychnine. This drug is absorbed by the mucous membrane of the cheek pouches, and under proper conditions, will destroy as high as 85 per cent of the animals in a given area. This poisoned grain can only be used during the dry season when natural food is scarce. During the rainy season, carbon bisulphid used in the burrows is very effective, but has the disadvantage of being comparatively expensive. The question of expense is less important when dealing with valuable lands, but the greater part of the heavily infested territory is comprised of grazing lands, from which the yearly return is relatively small.

⁴Read at the Twelfth Annual Conference of State, County and Municipal Health Officers, Chico, California, November 8-11, 1920.

Ten Counties Infected.

At present ten counties are known to be plague infected. This territory extends southward from San Francisco to the lower border of Monterey County, and eastward to the eastern border of San Joaquin, Stanislaus and Merced counties. No infection has been found north of this area, the bay and San Joaquin and Sacramento rivers seeming to form a natural northern boundary of the infected area.

During the present year during April, May and June, a total of 45,800 squirrels were shot in this territory and 185 proved to be plague infected. Particularly heavy areas of infection were found in Alameda, Contra Costa, San Benito and Santa Cruz counties. In some instances these plague infected squirrels have been obtained from territory immediately adjacent to towns and cities and in two cases from within the city limits.

The finding of infected squirrels in the immediate neighborhood of towns or cities brings the question of plague directly to the immediate attention of the local health officer for the reason that danger of transmission of the disease to the rat, with the resulting human cases which would certainly occur, is always a grave possibility. Both animals have been trapped from the same burrows and the disease has been transmitted from one to the other under experimental conditions in the laboratory. This danger is very real in the entire east bay region since the range of hills immediately east of these centers of population, extending from Hayward to Point San Pablo is plague infected.

Seasonal Prevalence.

Long continued study of the infection in squirrels has shown that seasonal prevalence has a great deal to do with the transmission of the disease. It has been found that during the first half of the calendar year, septicaemic cases are exceedingly common, diminishing in frequency as the winter approaches until in November, December and January, the few infected animals always showing a very chronic form avirulent in character, and very probably not transmissible by means of the flea. For this reason the spring and early summer are the periods of greatest danger from squirrel plague.

Attempts have been made to explain this seasonal prevalence, but it has not been possible to determine why chronic plague in January should become acute in April. The presence of young squirrels in this month offers an abun-

dance of susceptible material, but does not explain the first acute case.

The danger of infection directly from squirrel to man is probably very slight in view of the several essential conditions required to bring it about. First, one must have a sick squirrel with *B. pestis* in the circulating blood; second, the animal must be flea infested and the fleas must become infected; third, one of these infected fleas must escape to the body of man and feed while still infected. It is not proven that all infected fleas will transmit the disease by a single bite, in fact, most cases of human plague contracted in this manner present evidence of having been quite severely flea bitten. On account of the comparative remoteness of the squirrel burrows from the residence of man it is very improbable that houses will become infested with plague infected squirrel fleas.

In cases of human plague contracted from squirrels, a history is always obtained of the patients having gone into known infected territory and having come into close contact with burrows. In this connection the practice of hunting ground squirrels for food by individuals who are not acquainted with the danger, cannot be too strongly condemned. The process of cooking will, no doubt, destroy all organisms present, but there could hardly be a more dangerous practice than skinning an infected ground squirrel without protecting the hands with rubber gloves.

It has also been observed that human plague contracted from ground squirrels is much more likely to develop into pneumonia as occurred in the Oakland outbreak in 1919. While in the immediate vicinity of the bay region the climate does not favor the extension of respiratory infections of this type, it is very probable that the interior of the state in certain seasons would present more favorable conditions for a more disastrous epidemic. Favorable climatic conditions certainly exist in central and eastern United States, which fact emphasizes the potential danger to the nation, of this endemic focus which exists in California.

In order that the rat population of cities may be kept at the lowest possible figure, particular attention should be directed to the proper collection and disposal of garbage, and the proper construction of buildings in order that they may be as nearly rat proof as possible. This construction of rat proof buildings is the only method of permanently dealing with the question. While it may not

be possible to extend these provisions to cover all buildings in some cities, certainly all buildings where food in any form is prepared or sold could be so treated and it has been found that these buildings harbor rats in greatest numbers.

What San Francisco Did.

Probably the best demonstration in the United States of what can be accomplished in this manner is afforded by the City of San Francisco. The building and plumbing laws and laws regulating the preparation and sale of food stuffs, have provisions for building out the rat. These ordinances were adopted during and immediately subsequent to the second plague outbreak and are still rigidly enforced. A force of rat trappers was employed during the summer of the present year and most strenuous efforts have failed to show a catch of more than five rats per hundred traps per day. Since the normal catch in a nonratproof city is as high as 20 rats per 100 traps per day it is readily seen that some influence has been at work among San Francisco rats, as four years had elapsed since intensive poisoning and trapping operations had been discontinued. No explanation other than the extensive rat-proofing operations remains to account

for the condition. The danger of plague again becoming epidemic in California would be practically removed if other cities would adopt this distinctly progressive type of legislation. Much objection is met with at the beginning of a movement of this kind, but those most strenuously opposed become the strongest supporters of the measures after they have an opportunity to observe the advantages resulting from a purely economic viewpoint.

In order that the occasional case of human plague which will occur as long as infection in ground squirrels remains may be intelligently dealt with, the medical profession, particularly in this infected region should be on the alert to observe probable cases. Any case of rapidly fatal pneumonia, in which the physical signs are out of proportion to the clinical severity, should be viewed with suspicion. Any acute infection associated with glandular enlargement, unless the nature of the infection is known without a doubt, and any severe unexplained septicaemic should be immediately reported. Both the Federal Government and the state maintain laboratories for the bacteriological diagnosis of plague, the former in San Francisco and the latter in Berkeley, and the facilities of both are at the disposal of the

THE PRESENT STATUS OF BIRTH REGISTRATION IN CALIFORNIA.

By L. E. Ross, State Registrar of Vital Statistics.

One method of measuring the completeness of birth registration is to compute the birth rate based on registered births. It is known that the actual birth rate in a normal population is close to 24 births per annum per 1000 population; and while it is known that variations in the composition and characteristics of the population in different localities affect this figure within certain limits, it is fairly well established that in a state like California where the birth rate, based on registered births, falls below 20 per 1000 inhabitants, it indicates faulty registration.

The exact degree of variation in the composition of the population in different sections of California is at present unknown, and adequate information will not be at hand on this point until the results of the 1920 census become available. But the great variation in birth rates between the different counties cannot be accounted for by such variation; and after making every possible

allowance for this, as well as the migration of expectant mothers, etc., we are forced to the conclusion that in many California counties birth registration is extremely faulty.

The birth rate for each county in the state has been calculated, based upon the population as indicated by the preliminary returns from the 1920 census, and the births registered from January 1 to June 30, 1920. The results are shown in the accompanying map. In twenty counties the indicated rate is 20 or over, showing that they have attained the minimum degree of registration that can be considered satisfactory. Imperial and Placer counties show the highest rate, each being 24.8 per 1000 population. Then come Kings 24.6, Sacramento 24.1, Orange 23.3, Fresno 23.0, Madera 22.7, Ventura 21.9, Kern 21.8 and Tulare 21.6.

The inclusion of Modoc county among the twenty highest in birth registration is indicative of what can be done under

adverse conditions. The average density of population in this county is only 1.2 persons per square mile. The record of this county stands out in sharp contrast with such counties as Marin, for example, where the indicated birth registration is as poor as anywhere in the state.

At present the birth rate for California as a whole, based on registered births, is 18.8 per 1000 inhabitants; and while this indicates the best registration yet attained, it is certain that there is nothing in the composition of the population of this state that can explain so low a birth rate. It clearly indicates faulty registration. The accompanying

map indicates with fair accuracy the counties that are keeping birth registration down. It is believed that the minimum possible actual rate is 20 per 1000 inhabitants for the state as a whole; and on this basis there are at the present time in this state over 6000 unregistered babies less than a year old. This is a matter that merits the earnest attention of every citizen, civic organization, health officer, public health nurse, school authority and woman's club.

A birth certificate, properly registered, is the child's official introduction to human society. Without it his future welfare is jeopardized.